

10/26/00

- Imaging / Cataloging
- Tray movement
- Reference back to samples of interest
- sort for crystal only images
- storing images over time to compare images at Atr
- using to image as a filter
- 3 different temperature
  - 4°, 12°, 20° C
- > 10  $\mu$  xtal
- ideal 100  $\mu$  xtal
- Learning system
- zoom variable to more closely analyze regions of interest

6 times  
1st week  
1 ea/wk for 12  
after

companies

- JMAR
- OGB

Gripps - offshoot / Cyrex - competitor

Cyberlab.com?

- Gentle moves - not disturb drops in suspension

Enclosure 6

11/1/00 - Meet w/ DVT

- Resolution
- Low level algorithm access
- Open relationship for critique & improvement
- Documentation complete
- Group editing capabilities
- Complete remote access to thresholds
- Group thresholds

11/2/00 - SGC

- Store images in automated fashion
  - sort / categorize
- Sinkatron / X-ray Generator
  - 20-30 in xtal size - ideal
- Diffraction patterns generated from X-ray
- Single Plate  $\approx$  15 mins to manually analyze
- auto elimination of clear drops w/ no xtls.
- lighting & image quality not comparable to microscope
- Speed of jog through plate
- resolution of image
- Largest FOV - complete drop
- Smallest w/ microscope FOV  $\approx$  ~~1/2~~ 1/4 of drop
- VideoCMM II v1.05 J-MAR
- Measurement of xtal size
- drop size  $\approx$  2-4 mm dia
- light microscope / back light only

- Thumbnail images of each well  
maybe more 3-5 images per
- Thumbnails of all images per well
- live image update like video

10 prot. / wk or 30 plates / ~~day~~ wk  
3 plates / prot. 1 for each temp. 20, 12, 4 °C

5000 proteins / Sycur → 3 / day solved

Panasonic GP-F602 camera

Nikon 50 W AD - light source?  
- apertures 628 747

Fiber optic

Nikon 10x 16E 1  
3x 230 6

J'MAR Model: MST.XY.0410 PD40

Microscope

Olympus - (SZ7.12)

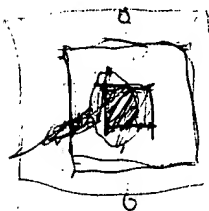
SZX-LD100

Pixera camera VC100C

Diffuse FO back light

11/9/00 = Inspector Testing w/ ERIN

- Find Error included in Average & Min?



- gives valid pad coverage  
- gives spot size find error  
because blob not in ROI

- disable or hide inspection settings at operator level.

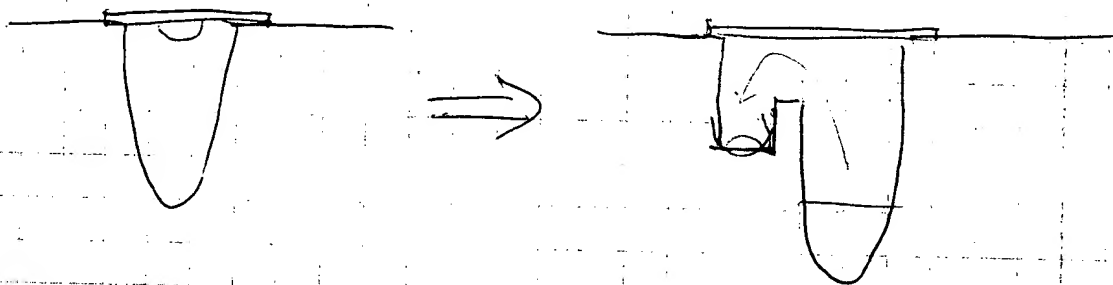
### Meeting

11/12/00 PURASIP - new customer

- Get Marconi Boards & Test results
- Schematic enough to order connectors & layout on box on Curbie
- SGX - sit down w/ Andy
  - camera lighting system
  - probe machine
  - software definition
- VSC -
  - how they hold slides
  - fix Galil problems
  - contact - set up time
- Update Website
- Call Febolovichy today

11/13/00 ~~SGX~~

- 2-4 mm drop size
- 4°C operation
- No heat generation by light / IR filter
- as small as 1 Micron in size
- dead xtal 100  $\mu\text{m}^2$
- 1.5 mm depth-of-field



- Bottom light source
- light source config vs x/y movement
- 5, 10, other plates on machine?

11/22/00 - SGX

LENS SELECTION - DESIGN NOTES:

FOV: 4 mm  
Camera Res.  $1024^2$

$$4/1024 \approx 4 \mu/\text{pixel}$$

Idea xtal  $\approx 100 \mu^2$   
for 10x accuracy

Min. camera res  $\rightarrow 10 \mu/\text{pixel}$

For High zoom/res:

xtal as small as  $1 \mu^2$   
for 10x accuracy

camera res  $\rightarrow 100 \text{ nm}^2$  or  $1 \mu^2$   
@ 1024 : FOV would be  $.1024 \text{ mm}^2$

11/27/00 - Meeting

- Sequenorm - Del coming tomorrow 9 am
- Type up new QC Checklist items
- X-mas party Dec 15 - Fri Eve
- 1/0 map updated on cubie - update program
- Weekly reports - bring to meeting  
summary of last week  
plan for upcoming week
- Get software from David for Inspector
- Get boards from UCI
- Get Demo Hardware for SGX

12/28/00 SGX

w/ VZM-300J lens

@ .75x Res  $\approx$  4.7  $\mu$ /pixel

@ 3x  $\approx$  1.14  $\mu$ /pixel

used spacing of wells on MTP to calc

FOV  $\approx$  1.5 mm x 1.17 mm .5 mm DOF  $\approx$

For ideal 1  $\mu$ /pixel

FOV  $\approx$  .13 x .1 mm

Edmund

→ VZM 1000 → 88 mm FOV

Infinity tube 100x → 109 mm FOV

Nitar

Ultra Zoom 10x → 1.2 - 18 FOV

1-60228 + 1x, M

current  $\approx$

~~1.5 mm~~

\$895

35mm WD

DOF?

\$1490

DOF  $\approx$

1.6 mm WD

20mm WD DOF?



1/2/01 - Meeting

- Andy Sturman - get new firmware
- Test latest inspector SW
- ✓ → Install arranger upgrade
- SGX proposal
- Marconi Status Report
  - Deliver components to VCI - Order connectors
  - Get all other parts
- ESI application

1/4/00 - SGX - Project proposal

- 25-26 January - Automation Partnership to visit
- Multi image viewer
- Bar codes
  - plates - kryogen?
  - TAP
  - Robot design
- Tube labeling

1/5/00 - ESA

- Variations around  $360^\circ$
- Continuous Start/Stop & Data collection
- Automated acceptance - data collection through-out  $360^\circ$
- \* - verify settling - in program
- \* - tuning support

~~1/10/01 - Design~~

~~CALL~~

1/11/00 - SGX (kick-off)

↓  
183 - 184 - 185

183 - MACH 1

184 - MACH 2

185 - ENGINEERING

- Determine Camera configuration
  - Board, Camera, lens(es), Light
  - Dimensions, WD (range), Motorize zoom?
  - Analog output to light-source
- Order Parts Next week 1/15/00
- VRE - check option
- Test Camera / Hi-zoom on Inspector
- Calibration Target
- Room Humidity - Temp? / Fog lens?
- RoboSoft / RoboVision Patent
  - call Johnny Ross

1/11/01 - Inspector

Spot Display - recenter or shrink so  
spot below doesn't show.

1/23/01 - GEX

- Experiment w/ 1K x 1K camera on Inspector Platform
- $\approx$  Resolution of camera  
57  $\mu$ /pixel
- observed excellent stability when stationary
- motor res. ~~at~~ 2.5  $\mu$ /enc cnt.
- pressure on baseplate introduced  $\approx$  10 pixels of deflection  
or  $\approx$  5  $\mu$
- with pressure on the stage introduced  $\approx$  40 pixels of deflection  
or  $\approx$  20  $\mu$

1/24/01 - Inspector Install 87.3 hrs

- Adjusted aspect positions after move of machine
- Matrix not always running after selection of matrix after pad
- Rebuild not triggering after update of taught position
- Oper Def table dump not working @ programmer level.

1/25/01 - S6X & TAP

- 12 plates / 3 1/2 - 8 minutes
- moves 1 m/s accel .5 m/s<sup>2</sup>
- check camera orientation
- valve for heating xtals
- 2/6/01 - meet w/ Beed Microsource
- John C. meeting for software & DB

1/29/01

- SM command  
AB, MO, SMI - look for IOV @ Drive Cmd  
not there immediately
- send new firmware w/ debug term enabled

2/1/01 - SCS - control kick off 1186?

- 3 phases
- concept
  - detail
  - build & debug

Control block diagram / concept.

- Distributed Galil
- PLC & Galil
- Think & Do & Galil
- VB & Galil

## 2/12/01 CCD - Detector Research

Rigaku

\* ADSC

Thomson-CSF

\* Mar

Banker?

Nonius

\* Jupiter

Meeting w/ SGX 2/12/01

- Must discuss computer location / cabling etc
- start/stop controls, etc.

## X-Ray discussion

- beam microsource
- mirror options
- detector as close as possible  $< 300$  mm
- diffracted beams - through solution or plate?
- reference x-tal after plate
- $40 \mu$  for CCD resolution more important than overall size
- Mike Blum build Mar CCD

## 2/14/01 - Robo Vision Development

Zoom optical

camera pixel size / pixel resolution = zoom optical

i.e. CV-M1 JAI camera  
 $\frac{6.7 \mu \text{ pixel}}{.67 \mu / \text{pixel}} = \boxed{10 \times \text{zoom}}$

~~fixed size camera~~

pixel size monitor = magnification  
 pixel size cam

pixel size mon. =  $\frac{\text{monitor size}}{\text{monitor res.}}$

$\frac{(17" - 1")}{1024} \times 2.54 = \frac{.0125"}{\text{pixel}} \text{ or } \frac{317.5 \mu}{\text{pixel}}$

$\frac{317.5 \mu / \text{px}}{6.7 \mu / \text{px}} = 7.388 \text{ M} \times 10 \times \text{zoom} = \boxed{473.9 \text{ M}}$

Image scaling

$\frac{\text{Twips}}{15} = \text{window size in px}$

$\frac{\text{window size in p.}}{\text{mon. res.}} = \text{scaling}$

$17960 / 15 \rightarrow \frac{117}{112} = \boxed{9354} \times 473.9 = 443.3$

key variables

camera px size  
 monitor size  
 monitor res?

3/16/01 - SBX

$T_0$  - image after loading

~~24 hrs~~

$T_1$  - 1 day

$T_2$  - 3 days

$T_3$  - 7 days

$T_4$  - 1/1 wk out to 13 wks.

4x

every well every time

@ drop view  
unless dried up

40% of plates have @ least 1 crystal

Crystals may need further zoom

Non-Crystal images - delete

40 proteins / wk → goal for stability

2 plates / protein

≈ 140 plates per wk - after optimization studies, etc.

BTU estimates

- UPS system for data integrity on Gantry



Weekly  
3/26/01 - Meeting

- get new firmware from Galil
- Goal - SGX - ship Friday
- make list of questions
- description of functions for SGX
- SGX to come ~ Thur to review machine functionality

- 
- Questions for SGX 3/26/01
- plate types intended for initial run.
  - image delete features
  - image load features
  - image save options in manual explore mode.
  - invalid Barcode - enter manually?
  - Drop size?

SGX needs.

- bar code / type plate

Database Notes

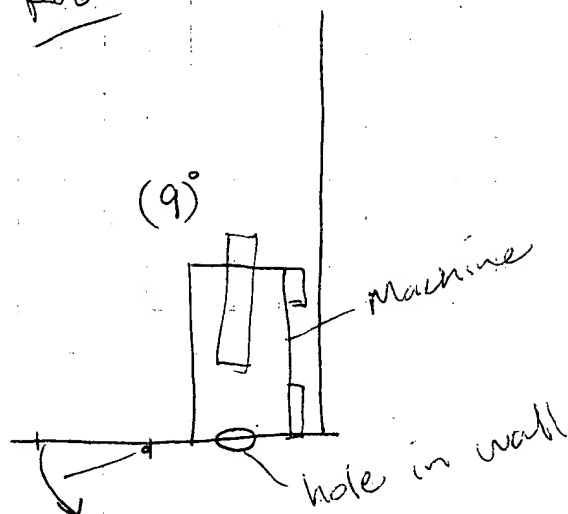
- data indicating z-height adjustments  
 right "

3/29/01 - SGX

- thumbnail view order confusing
- highlight location in tray associated to thumbnail
- updates of display for matching location
- status display updating during run
- Paused live - images still dumping to thumbnail
- measure display in microns
- plate select updates thumbnails
- select saved images after a manual exploration

- visit to go through variations of drops
- dark field illumination from back
  - Janet has sample light
- focus issue worse in a sitting drop
- new name? for machine

- 
- Drop Find - key function
  - Thumbnail shows drop if found

RoomProcessing

- focus @ bottom of well to check for crystalline in salt tube
- typical drop size - 3-5 mm  $\approx$
- inspect for jolted trays
- size of crystal
- shape
  - 7 - grainy precipitate, possibly crystalline  $< 10\mu$
  - 8 - sparkles, resolve xtals  $< 10\mu$
  - 9 -  $> 10\mu$
- size, volume estimation
- guess at morphology - shape
- temperature
- soft by chemistry make up
- intergrown crystals

now

96 well	}	hanging drop / definite
48 well		
24	}	possible
1536		
		96 sitting drop
		1-2 mos

- Array Definition needs to accommodate multiple drops per well
  - invalid barcode
    - ability to run anyway
    - possibly enter ID
    - not automatically store images
    - eventually dumped if not handled manually
  - 10 alpha numeric
  - first character identifies tray
- 

### 4/2/01 - Staff Meeting

- AMGEN - Brian wants to visit. get pharmaceutical bus.
  - SW engineer - give a test, interview Wed.?  
actually sit at some code.
  - meet w/ BioDiscovery on Thursday. - collaboration.  
Thurs. - Santa Monica 10 ~
  - meeting report - from SGX meeting
    - write phase II quote.
  - need more communication as to SW status. - Brian not understanding, why SW can't be released.
  - Tax Audit on Friday
  - Book SGX storage system this week?
  - Warranty needed for RoboArrayer. - Must be 1 yr Limited
  - Machine on floor - SGX - needs SW install
- 

### 4/2/01 - Marconi

- Change to add AC offset works
- \* change range to 0-7
- \* part availability for AM270512
- \* no less than 20 ms poll value / maybe 40 ms

## 4/3/01 - SGX SW testing

- drop position not applied properly to correct for drop position
- drop images not displayed during run as thumbnail
- 579.3, 1488 → 577.35, 147.28 C1+C2  
649, 440 215.665 68.38 Δ
- Version # on Insp. Lib
- Homing after EMO not working
- Image update of control app not always displaying on SPC
- predefined bar code ID for certib

## 4/4/01 - SGX SW Testing

- Pub direct → for images
- DB Mon - Install Dir
- Current re. # DB, # txt

4/4/01 - Marconi - Cont. Call

- Find PADS File, with additional layout
- Clock Free, running 186 @ changes.

4/5/01 - SGX SW

- pixel Res. set as by Ref on zoom level
- closing SW - turn light off?
- Build 18 no skipping plates absent
- find drop not fun to / input, curvy offset param
- focus offset - persist
- if not valid drop position, return false
- improve filtering of drop selection

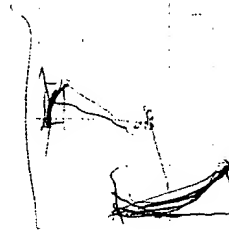
4/9/01 - SGX SW focus

Load plates  
Home  
Select plate type

Ctrl - right click  
left click  
adjust offset for  
next image  
Ctrl - left adjust & jog  
offset

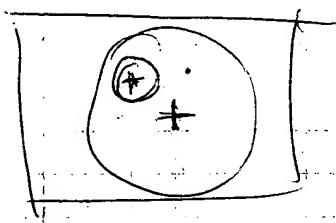
4/9/01- SGX SW

A1	-	- 1032	670
A2		- 955	278
A3		- 131	690
A4		0	0
A5		245	667
A6		151	637
A7	-	419	194
A8		255	372
A9		302	881
A10		302	643
A11		235	1176
A12		700	1444
B1		-191	844
B2		0	0



$$\begin{array}{r}
 569.448 \\
 - .420 \\
 \hline
 = 1.032 \\
 567.996
 \end{array}$$

$$\begin{array}{r}
 569.448 \\
 + .420 \\
 \hline
 569.860 \\
 + 1.032 \\
 \hline
 568.828 \\
 570.892
 \end{array}$$



- Image Save option during manual exploration
- persist ~~save~~ plate type
- persist focus offset

~~1500 300~~

$$\begin{array}{l}
 512 - 501 = 11 \\
 648 - 440 = 208 \times 6.7 =
 \end{array}$$

## 4/10/01 - SGX SW Testing

- Run Ispet button on Cam Set page not wired

## 4/10/01 - SGX @ 109.8 Installation #32

- ~~Focus~~ <sup>Focus</sup> adjustment - easier & automated
- interlock
- intuitive controls for manual exploration
- Save Button & Print button
- Automated Live
- EStop recovery
- Error "Op Grab"  
failed grab operation - related to motor error
- EStop recovery related most likely

## 4/10/01 SQNM - E61-

- Not seeing straight position
- Run 2x after initial load of Matrix
- 384 chips mostly
- Incoming QC
- DUT timeout errors  
→ more frequent when ~~the~~ power save on laptop triggers
- Application already running
- Inspection results not display on front screen
- Header each printed page...?
- pos error on z-axis
- DUT timeout errors } retry not always working
- Data on Reports "non-sensical"  
→ Add count for find errors  
→ need other examples
- Inspection Time seems high
- Motor Driver?
- DB access?
- Motor Tuning?
- DUT event handling?



4/11/01 Marconi

- Gene & Ted continue testing
- Meetings continue on Wed
- Oscillator exact frequency -
- C-15 range on 'r' command.
- Defaults - for GN PL, ZR
- verify that we power up with same defaults
- CP command not maintaining through Power up

4/11/01 - CANM - Matrix Inspector (1099.74)

- New SMIF not compatible - 'Failed to Open Motor IF'
- 384 taught vs build offset on inspect pos
- intensity reference move to not overlay pads

4/11/01 - SCX

- \* E stop during move - didn't recover
- Setting for second pass, zoom level
- ability to re-run plate w/o having to find the drop again.
-

## 4/12/01 SGX - Database Discussion

- Inspection Workable Database
- Mirror of Server vs. Robovision
- Query builder tool
- Offline viewer
- Inspection List builder
- Results Xfr
- Maintenance Utilities
- DB Editing Utility

## 4/16/01 - Weekly Meeting

- Get Final Revision of software out ~~of~~
- SGX roadmap - meeting Tues "what's next"
- Assist in Opto 22 update w/ David
- Pin inspection
- Newcom need clock frequency of 180

## 4/16/01 - Staff Meeting

- Call Sequenom in Germany about visits
- Patent Application on Robovision
- Review points for Sequenom issues
- Forward Email to Brian on Volume Insp. f/Wilbur

## 4/16/01 - Depth of Field SGX

2.5x  $\approx$  ~~200~~ $\mu$ m      1x  $\approx$  1000 $\mu$ m  
 4x  $\approx$  150 $\mu$ m  
 5.5x  $\approx$  110 $\mu$ m  
 7x  $\approx$  80 $\mu$ m  
 8.5x  $\approx$  60 $\mu$ m  
 10x  $\approx$  50 $\mu$ m

\* Sorting of images by well # in thumbnail is well not correct

## 4/18/01 - All Patients, John Ross

- Robocast - need examples of implementation
- block diagrams
- show robocast vs. old, other methods.
- nomenclature for our method.

## 4/19/01 - SGX (113.5 hrs)

- E-stop Recovery - position error?
- 48 well drops on edge not found
- scoring system
- right-click on thumbnail to goto
- keypad manipulation of manual exploration
- add images manually taken to thumbnail view
- manual correction of drop find
- 2nd, monitor attached
- improved focus algorithms
- drop height 2mm or less
- slices may be preferred
- focus scans during find drop also worth inv.
- Disk storage utility
- Remove File Exit from Config
- Pause live while measure
- if possible remove cross hairs on Magnify Glass
- manual exploration restore zoom & light to run settings
- 1536 integration low priority but to be able to at least image/approach?

4/23/01 - Weekly Meeting

- M [ - Final software out this week for Marconi  
 [ - Quote out today for PH II ReboVision  
 SGX [ - Meet w/ David to discuss next release  
 [ - Test David's current release candidate  
 [ - Improve Focus methods

4/25/01 - Marconi

- Firmware go ahead, if closer to a week
- Double check clock circuit

4/26/01 - ReboVision Install SW RLS SU31

- Install ReboVision
- " MVTools w/ ITEX
- make sure "small fonts" under video card, settings, advanced
- upgraded SNAP ID, .ocx to 3/6/01 version
- increase paging file

4/30/01 SGX - SW testing

V. 25

- clear home indicator once EMO pressed
- well selection doesn't follow thumbnail selection
- \* - live & auto focus flashes
- when right-clicking well to go to, thumbnail doesn't get re-painted (or hidden) when moving the mouse off that well selection
- plate well status bar
- File Close on Config screen causes Run not to work anymore
- Off line processing, or 11 processing of Find Drop?
- Run doesn't stop @ end.
  - shows "reeling bar cal" (manual ID plate 1) when happened
- new V0 driver installed, doesn't restart after disconnect
- manual ID, plate did not run second pass after find drop
- left second plate (which was disabled) selected.
- right-click on thumbnail for goto, not working
- left right, up down navigation through thumbnails is off.
 

up → right	right → down	} correlates to plate position not thumbnail?
down → left	left → up	
- when using ctrl- "failed to find H6 ~~well~~ record"
- image display did not show selected image
  - not sure how it got in this state.
  - press Run again then stop after a few wells then it worked again
- focus, remove overlay on focus image

## 5/1/01 - SGX SW Testing

- When new run, new plate enabled, old plate not deselected (re-painted)
- Well status after an manual correction how is it updated?
- after manual correction, thumbnail updated, but large image still shows well view, if run stopped mid plate
- next/prev option with Auto-Focus?
- after manual exploration, goto an new well, zoom restored, light level not.
- well image display (small) appears grainy b/f image grab.
- ctrl-jpg moves selected image unless you select outside of thumbnail view first
- thumbnail @ plate view not always hiding after right-click goto
- DMU status colors correct?
- 96 well 48 well selection N/A/linked/remove
- 48 well highlight not correct size
- live after double-click goto

5/2/01

- Pause - Red button should flash?

123

5/1/01 - Pyxis - Cubie meet w/ Eric

- Cubie has wedge to hold ~~contacts~~ ~~down~~ stay connected
- Start, Stop light bulbs
- Relay on camera or so it doesn't fail
- Brad or Tom, Contact while Eric out
- the next 2 wks
- Andy ~~etc~~, new firmware for board

5/1/01 SLK Den

- During Run, all die says of well update
- Check sheet with staff
- Referenced memory @ could not reach
- Database system + time / check, laser
- 1536 plate, robot in house for plate
- plate ROI & who check in DB

5/3/01 - Robb ARROW

### LENS SELECTION

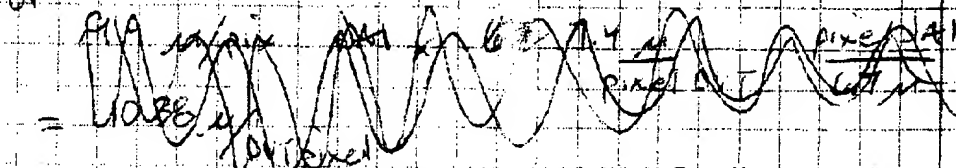
EDMUND

12M-3000

FOV min

or 2/3 format 2A1 1300 x 1000

9.7  $\mu$ /pix  $\rightarrow$  2.3  $\mu$ /pix  
 or 12.2 mm  $\rightarrow$  2.19 mm for 2/3" format



$$\begin{aligned}
 & \text{or } \frac{4.8}{8.8} = 545 \times 12.2 \text{ mm} = 6.65 \text{ mm} \times \text{DVT} \\
 & \quad \quad \quad \times \quad \quad \quad = 4.99 \text{ mm} \times \text{FOV max} \\
 & \text{or min} = 1.63 \text{ mm}
 \end{aligned}$$

VZM-300i

$$\text{max } 6.65 \text{ mm} / 640 \text{ pixels} = 10.39 \mu/\text{pix}$$

$$\text{min } 1.63 \text{ mm} / 640 \text{ pixels} = 2.54 \mu/\text{pix}$$

OR

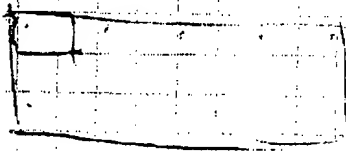
VZM-200i

max @  $\frac{1}{2}$ " format  $\rightarrow$   $\frac{1}{3}$ " format

$$12.0 \text{ mm} \times \frac{4.8}{6.4} = 9 \text{ mm} \times 6.75 \text{ mm}$$

min @  $\frac{1}{2}$ " format  $\rightarrow$   $\frac{1}{3}$ " format

$$3 \text{ mm} \times .75 = 2.25 \text{ mm} \times 1.69 \text{ mm}$$





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5/10/01 - SGX v 1.1 SW install

122.2

Old SW

	Zoom	X Pos	Y Pos	Z Pos	Max Light
1	0	60.806	19.083	79.903	948
2.5	146.917	60.455	188.693	77.383	741
4.0	28.2	60.495	188.818	77.203	795
5.5	49.905	60.520	188.878	77.110	809
7.0	23.49	60.426	188.915	77.143	1010
8.5	4.815	60.520	188.935	77.40	1109
10	-4.59	60.525	188.943	77.155	1158

plate 5088 X Y Z 6 1 -12.2 -13.5 -97.0 XYXRF  
 48 0 0 -10.9 6 8 -4.8 -10.2 -13.13 X"  
 96 0 0 -4.9 8 12 -5.4 -5.9 -9.90 YX"

Start Pit -1 100 settle plate Pres.

Load Pattern 560

Identify " ex Barcode, 1000  
 Setwell " (wet)

AUTO FOCUS - NEEDS DROP SIZE ADJ. \*

- Did not skip all thumbnails missed two that were well status, then plunged next well into that wells slot.
- Score not updating immediately in display go to next well then back
- Color status not updating.
- must click on plate to
- Once a drop found, update/correct position via software
- Op Carab E10r / Hammer, did not Recover

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5/29/01 - Meeting

- QB tester - ~~now~~ working
- Cloneteck Temp/Humid interface 12 wks from last week
- Review Robot - today about RS/TM schematic tomorrow 10:30
- Marcom - review schematic tomorrow 10:30
- SGX - train controllers
- Vision development
- X-ray pre installation today w/ John?
- DB to in Kurt
- call / Deliver Wed?
- change of Deliverable

5/29/01 - SG

- Database protein

FREEZER: 1 ml Al  
 Clone name  
 prot. order ID  
 rack # Box  
 Align ID Box  
 force position

LAB

Align

110  $\mu$ l  $\rightarrow$  96 x

Tray Type

 $\rightarrow$  Tray Params $\rightarrow$  Wells $\rightarrow$  Content

130.3 hr 4.65 GB

working w/ Kurtis, Howard, Michael  
 range (9x) ? ~~to Gary~~  
 110  $\mu$ l  $\rightarrow$  Box  
 Matrix tubes  $\rightarrow$  Tray  
 Barcode ID  $\rightarrow$  Bar Code

Done w/  
 110  $\mu$ l per well / Robbins Robot

Tray

$\rightarrow$  prot. order ID  
 $\rightarrow$  Temp  
 $\rightarrow$  Bar code

 $\rightarrow$  Secure well $\rightarrow$  Crystal

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- X00 297
- X0000003 Scored
- X0000012
- Bar code printer?

- Clear/not clear
- refine Autofocus
- Janet class on Crystal

5/30/01 - Marconi

- Q: Find Block Diagram?
- Q: Reserved PLD source? y

\* - review encoder inputs with Galil

\* - verify debug part is PG on Robo schematic

- Documentation

- BOM or
- Fault tree Yes

- John to email timing of Deliverables

- John also to check requirements for Fault Tree

\* - Solve RS command issues w/ Galil Defaults  
vs. saved parameters

Get SW Release from David

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6/1/01

- Phase
- Wavelet based would definitely give positive results for differentiation
- none in all objects or regions of interest
- bin regions based on texture
- perform statistics on bins
- \* - brushlets contains phase
- \* - local features

David Field  
Brumell Oursen

wavelets  
leaflets - UCB  
charl walsch DOL?

Neuro Science

Edgelets

Curvlets

Robulets

\* / Branchlets

David Dornahoe Stanford

Victor W. ...

Duane De ... - Neural Expert UCSB

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6/1/01 - SGXANET'S CRYSTALS

- color to distinguish light precipitate

9 - more  
needle - 1D  
plate - 2D  
3D

- grainy - distinguish? by sparkle

+ quality order 3, 2, 1, 4, 5, 6, 7, 8, 9

- 1-2 early in the process

- 3 cons happen late

- 7 different from 8 by shape beginning to be discernable

- distinguish btw single &amp; not

- difference btw 8 &amp; 9 sometimes relative

- 1 heart, am vs many

SW\* Set reference zoom when viewing

\* auto scale jg inc. on size

\* Printer

SW\* Remember ~~what~~ whether images are loaded  
or live, don't goto, if ~~live~~ not live

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6/8/01 - Marcum - NOT DONE?!

- Couch Axis
- PMDC Single Speed Fails
- Gene To get more info & ~~define~~ define problem

6/11/01 - Weekly Meeting

- Identify Components for RotoArrayer Vision
- look @ Storage carousel for Clonetechn
- \* - Hardware / SW Selection to replace P.V.T.
- Forehealth coming Mon-Tues - Next week
- \* - Quote Ph II image DB - SGX
- No arrayer on floor from 6/21 - 7/21

SGX SW Tasks

- David to show where in SW data is saved / updated
- Well view kept for not found drops improved
- ~~well~~ Drop size passed to autofocus
- ~~Drop~~ Zoom level set by drop size

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6/13/01 - SGX DB

Data Saved  
from Operator  
Form Key up event) labeled by ~~xxx DATA~~ key events

(Plate Display  
OnWell Score) } save score  
in memory

Manual  
load

(Plate  
Save Plate Data) } write to file  
~~main~~

(Image Storage) } handles saving image  
while running

Scoring Form (keypresses) \$-  
Right click Lead1 (Main Image)  
Click on Plate Image (L6) bmpPlate() □ □ □ □ □ □  
Click on ImageList LeadingList1

Select Plate } loading Data in for a plate

6/15/01 - SGX

6/20/01 - SGX - Calculations

AUTO FOCUS SLICES - TOTAL NEEDED?

Worst case:

Assume 3 mm drop Diameter

Assume  $\frac{1}{2}$  sphere geometry

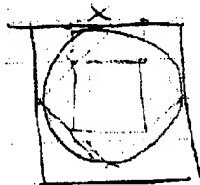
$$r = \frac{3}{2} = 1.5 \text{ mm}$$

@ 10x zoom  $\approx$  depth of field (measured) is 50  $\mu$

or .050 mm

$$1.5 \text{ mm} / .050 \text{ mm} = \underline{\underline{30 \text{ slices}}}$$

Size X x Size Y



OR

6/29/01 - SGX Auto Focus Upgrade

Upgrade (1362)

- 48 well circle highlight to small
- depth of drop seems ~~large~~ than thought
- true geometry not  $\frac{1}{2}$  sphere
- 2nd run not running on same plate
- w-axis erring out
- not saving status from previous auto-focus
- plate types - different height  $\approx$  14-15 mm
- possibly calculate z from first 3-4 autofocus attempts
- small drop filter - fail find drop if too small

- Image comparison, filter by change

- User name for scanning

- John wrote Tray setup (Driver to print barcode)



7/2/01 - Meeting

- Clonetech - Electronics ~ July 15
- Light design for Clonetech - get w/ Jason
- Get camera up & running
- Added feature / default power-up on Marconi
- Quote Wilbur on 96 Head offset
- Call to find Techs - Mechanical, Electrical, Service  
ESI moving

7/5/01 - Crystal Strategies

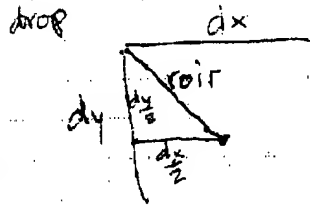
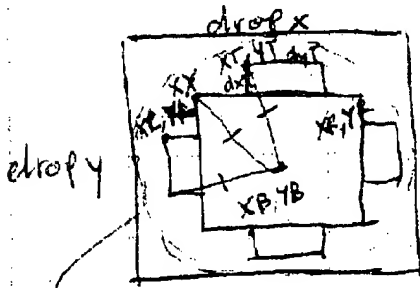
- Test image set - Initial something/nothing
- Measurements
  - number objects
  - length, width of objects
  - # of dimensions
  - gradient
  - grayscale

512 x 512  
ROI

- ROI w/in Drop / minimal shading
- Grayscale calibration of each FOV?
- Grayscale target
- Identify optimal contrast w/ gain, offset
- 3 1/2 Hard Drive
- Tools Defined

John Analysis approach / discovery      David - Supports  
 - Classification      Tools  
 - Models - Code Algorithms

drop Rois SGX 7/12/01



$$\text{drop size} = \text{dropx} \times \text{dropy}$$

$$\text{roi} = \text{dropx}(\text{roiPct}) \text{ by } \text{dropy}(\text{roiPct})$$

$$\text{roiPct} \approx .55 \text{ example}$$

$$dx = \text{dropx}(\text{roiPct})$$

$$dy = \text{dropy}(\text{roiPct})$$

$$(\text{roir})^2 = \left(\frac{dx}{2}\right)^2 + \left(\frac{dy}{2}\right)^2$$

$$\text{roir} = \sqrt{\left(\frac{dx}{2}\right)^2 + \left(\frac{dy}{2}\right)^2}$$

radius assumes circular

$$XTB = X + \frac{dx}{4} \quad dxTB = \frac{dx}{2}$$

$$YT = Y - \frac{dy}{4} \quad dyTB = \frac{dy}{4}$$

$$XL = X - \frac{dx}{4} \quad dxLR = \frac{dx}{4}$$

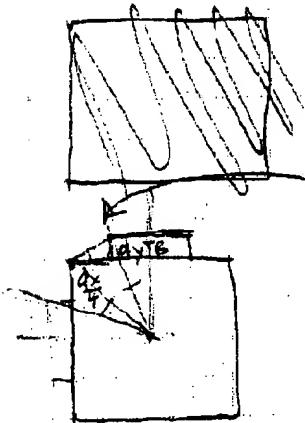
$$YLR = Y + \frac{dy}{4} \quad dyLR = \frac{dy}{2}$$

$$XR = X + dx$$

$$YR = Y + \frac{dy}{4}$$

$$XB = X + \frac{dx}{4}$$

$$YB = Y + dy$$



if assume  $\angle$  is  $\frac{1}{2}$  of  $45^\circ$  then

$$dyTB = \frac{dx}{4} \left( \tan \frac{22.5^\circ}{23^\circ} \right) = \frac{dx}{4} (.4245)$$

or for circle

$$\rightarrow \frac{dy}{4} (.4245)$$

to approximate for oval

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7/13/01 SCX - RoboVision Testing

Run of an already run plate fails  
- stops immediately

B10  
C4  
D4  
E10  
E12  
G4  
G8  
G12

A5 - find drop found center point only  
A7 - " "  
B7 - found ?  
C1 - " "  
C7 - " "  
E3 - " "  
E4 - found ? edge  
E7 - " "  
G9 - found ? edge

On miss find drops  
adjust min drop size ~~threshold~~  
was 600 to 15000  
should have found A6, A11, B9?, E8?, G10, H5, H11  
change to 10000

Add 3.0 zoom settings  
3, 1, 3, 2.257, 0.215, .0012, 0, 114.075, 570, ...

7/16/01 - Weekly Meeting

- Follow up with Curtis on quote & Tom DB ph II  
SCX install software upgrade - autofocus & scoring.

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7/16/01 ~~SSX~~ - RV TestingProblems -

- multiple plate scoring, not always saving data
- z offset not being applied

Approach

windowed analysis  
gaussian windowed  
for entire image show response type by regions

initial classification approach in

2-3 wks.  
usually \$2500 for run-time dll

1

7/10/01 - SGX

- Operation Drop Error
- Op Drop
- \* - Force, Autofocus?
- 48 well changed to dynamic zoom selection
- clear status
- score should not show color code for subsequent inspection

7/19/01 - SGX - review status & features

- focus looks good
- scoring status displayed from historical scores
- current tube, don't display when looking historical
- now have score viewer
- show scores check box, on local plate box
- Focus of mouse, replace, jay, correct, etc.

X 459 - B5, C10

- User login

6/9 9/10 2/17/04

9

7/30/01 - SGX / Sunset

- how to present clean / not clean
- how to show last cores
- Sitting 90° D
- Auto focus on command / manual
- Replace feature set a way & working
- don't show virtually duplicate images
- don't show x-rays 2nd time

7/31/01 - Reba Kruger

- camera on order
- SW interface to vob
- CE on camera / board
- Small pin inspection

3 August 2001

Oil filled tray with eosin stained lysosome in columns

1-8. (Eosin/lysosome mixed with 8% NaCl in 10mM NaAcetate pH 4.5)

Drop size      Column

100 nl	1
150 nl	2
200 nl	3
250 nl	4
300 nl	5
350 nl	6
400 nl	7
500 nl	8

→ Want to use this size if possible

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8/6/01 - Weekly Meeting

- Clontech here <sup>Wed.</sup> - Darryl will send Agenda
- Prelim. FTA to John-Marcini by Friday
- Ship RV 2 in office
  - software updates.
  - support code for reports etc.
- Get add out for SW engineer
- Motorola here tomorrow Tues

8/9/01 RoboVision SW Debuglook  
IN

- Correct Op for abrupt error
- Move Next for loop error

8/13/01 - Weekly Meeting

- Vision Debug w/ David - Clontech
- Ship RoboVision Tues
- Work w/ David to Recommend Barcode Solution
- ForeHealth in today @ ~~12.00~~ 2.00
- SGX on Wed AM
- Investigate data recording on Temp/Humid. Chamber
- Output / program on Controller

BBQ

11:30 - 1:00 / Crown point

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3/20/01 - Weekly Meeting

- CloneTech - hit list / Andy keeping updated
- Need Rework head
- Build from David for 1st install
  - Mike to help
- images of good spots from Darryl
- Bar code reader, recommended
- SGX - list issues / review w/ David & Kurt
  - meeting @ SGX today 11:00 a
  - fix install w/ Mike
- Oklahoma visiting at 10:00 a

Marconi 3/20

- on Reset CSP signal / interrupt p chip select from Micro responds, then done

± 15 &amp; ± 5

- Quartz not functioning
- Clock out on CB331 10.384 exact?  
check w/ Gabil
- 32.768 xtal for quick power up

- modeclk pulled high
  - changed to pulsed low at reset

Xtal p/n → Epson MC405 32.768 KHz Surface Mount  
Citizen CM201  
ES02JA



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## 8/21/01 SW Testing SGX RoboVision

- ? - Trying to find scenario when scores not saved.
- 1 - ~~LABOR~~ - on 1st inspection after start of app if zoom req. is 3, it does not go there, stays @ 10 or home location
- X - correct & replace, then subsequent run stops on that well
  - drop x & y too big

## 8/22/01 SW - Testing SGX

- Load plates not always clearing plate status
- X - Didn't save plate data?
- X - zoom control not working on live
- X - manual correct, stores pixels & 2.5 zoom & Z = -5
- X - load plates dialog not clearing F. image is not live - redraw issue - only if image in display
- ? Skipping first plate - ran 1st time through
- On Well Start: failed to any well records for plate
- GetNextSeqUp - Stop plate
- Seq: Start Plate
- Set Zoom
- Stop Plate
- ? All FindDrop took forever, did not find
- ? - Cannot select plate ~~after~~ after run
  - same problem - plate record not saved
- ✓ Drop pos Z shows same as X after correct
- ~ 48, well FindDrop
- Display scores on autolabel
- Test correct & replace
- Replace image not working in thumbnail view

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8/24/01 SGX SW Upgrade v. 1.6

SN 31 150.0 HRS

drop image status being written as -1  
plate status "started"

8/27/01 - ~~SGX~~ Weekly Meeting

- clax - Talk to Janet about coming up for sign-off
- fix install
- Meet w/ Database guys demonstrate

8/27/01 SGX Robo Vision still debug

VG driver 1.3.0 05/10/01

Motor 2.3.1 02/19/01

@ SGX

SG32 - 3.4 G Free 166.8 HRS

SN31 - 3.4 G Free 150.5 HRS

- complete un-install, & Clean
- Reinstall, still not working
- Data problems persist
- Installed mdac 2.6
- All started to work...
- Thumbnail updates, store for next run doesn't work

SN31 - change 2nd NIC to NETBUS ONLY

8/28/01 - RoboArrayer Inspections

- Average offset for each image represents ave pin position,
- normalization of 0,0 pin position for a head of matched pin gets...
- measure pin to pin variations w/in same images
- All pin position measure
- Check distortion on lens

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8/28/01 - SGX Meeting w/ DB

- inserted in moving images as a plate check
- scores before find drop on well the plate, find drop run on those wells @ 3x
- Max score not being updated in plate record
- 2nd machine, transfer of some Barcode over images
- Autofocus, sample on/off

8/29/01 - Buyoff, Clontech

- Main Array Pinch & Test next week
- Rework Testing next week
- Barcode complete 2 next week
- Report write out 2 next week
- Rework Time estimation/algorithm next week
- Inspection Function This/next week
- Robot Interface
- Alarms
- Release

8/31/01 - Weekly Meeting

- Half Array w/ Calibration plate/SONM

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9/24/01

SQNM - Andreas called

Failed  
use Pin

to open digital interface -

192.168.1.102

3,0202

to

identify HW or SW

9/28/01

SGX SW upgrade v. 1.7

SN 32

218.0 hrs

31.1 G Free

SN 31

162.2 hrs

35.2 G "

✓	2	-	3	-	16
X	3	-	4	-	16
2	1	-	3	2	

+	(1.77)
(1.63)	

Setting

op array def

-3 2

set

-7.06 x

set

-3.99 y

set

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10/18/01 - SGX

- Auto Focus not working well on clear drops
- Goto live from thumbnail not matching
- Score erased when replace image
- Light watchdog?

\* - User ID - Log off Auto?  
 ? \* - List of Field names

10/22/01 Weekly Meeting

- SGX meeting This morning
- Clear/not Clear SGX this Friday?
- Accel & Vel for X-Axis
- Tuning updates on all other Machines

- Kurt's analysis / statistics?

[SGX]

Link login to their DB  
 they can add to our mdb.

- Auto focus improvements
- Second inspection offset